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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	: 09/807,125	Confirmation No.	: 4260
Applicant	: Jorg BAUMGART, et al.		
Filed	: October 10, 2001		
TC/A.U.	: 2851		
Examiner	: Andrew Sever		
Docket No.	: 225/49845		
Customer No.	: 23911		
Title	: Measurement of Small, Periodic Undulations in Surfaces		

RESPONSE TO FINAL OFFICE ACTION

Mail Stop AF **July 8, 2004**
Commissioner for Patents
P.O. Box 1450
Alexandria , VA 22313-1450

Sir:

The following Remarks are submitted in response to the final Office Action mailed March 31, 2004 regarding the above-identified U.S. patent application.

Applicants acknowledge that the Notice of Allowance mailed September 23, 2003 has been vacated, and that prosecution of Claims 14-19 on the merits has been reopened. Applicants note in this regard, that the Issue Fee for this application was paid on November 6, 2003. Accordingly, upon receipt of a new Notice of Allowance, they will request that the amount previously paid be applied to the fee due in connection with the new Notice of Allowance.

Claims 14-19 have been rejected under 35 U.S.C. §102(b) as anticipated by Yamatake et al (Japanese patent document 3-295408). However, for the reasons set forth hereinafter, Applicants respectfully submit that Claims 14-19 distinguish over Yamatake et al and remain allowable, as previously indicated.

The present invention is directed to a method and apparatus for detecting and measuring periodic wave patterns on a microscopic scale in finished or polished surfaces. For example, such wave patterns are found in so-called "smooth" surfaces which are produced by grinding, finishing on a lathe, burnishing, rolling or external abrading. (See specification paragraph [0004].) To detect such microscopic wave patterns, the surface which is to be tested is illuminated using a primary beam of monochromatic coherent light, which is directed onto the surface at an angle of incidence that approximately grazes the workpiece surface, and in a direction which is oriented at approximately right angles to an expected periodic wave pattern that is to be detected. Directing the illumination onto the surface with such an orientation, results in the generation of a diffraction image of the periodic wave surface structure in the secondary light beam which is propagated from the surface. By analyzing both the intensity and spatial distribution of the diffraction image contained in the secondary light beam, both the period and depth of wave troughs which form the periodic wave patterns in the surface can be determined.

The Yamatake et al reference discloses a method and apparatus for inspecting "irregular surfaces" in which a coherent parallel light flux is directed onto an area that is to be inspected, at an angle of incidence which is between one and ten degrees. (See translation, page 10, second full paragraph.) A

diffraction image pattern contained in the secondary light beam emanating from inspected surface is then analyzed. To this extent, the Yamatake et al reference is similar to the present invention.

However, Yamatake et al differs from the present invention in both its overall purpose, as well as the manner of implementation of the method.

As a preliminary matter, it is noteworthy that the Yamatake et al reference does not teach or suggest a method for detecting small periodic wave patterns in a surface, as recited, for example, in Claim 14. Rather, Yamatake et al draws a clear and important distinction in this regard, between "non-defect irregularities", on the one hand, and on "defective irregularities" or "defects" in the inspected surface, on the other. So-called "non-defect irregularities" include those minute irregularities that are necessarily formed during manufacture, and are present nearly uniformly across the entire surface of the manufactured article, "such as polishing scratches, rolling marks, patterns formed by electrolysis, cross marks formed in the surface of metal veneers by crosses in the backing when metal veneer is overlaid on a base material and pressed, etc.". In contrast to the latter, the Yamatake et al reference is directed to the detection of defective irregularities or "defects", "such as dents and debris, etc.". (Translation, page 5, first full paragraph.) Indeed, the overall purpose of the Yamatake et al method and apparatus is to provide an arrangement in which the

presence of "non-defective irregularities", including minute grooves 21 and cross marks 22 (which may be of a periodic nature) as shown in Figure 2 can be distinguished and eliminated from consideration, so that the defect 23, in this case a dent, can be detected effectively using automated processing techniques. (See translation, page 8, last paragraph.)

It is apparent from the foregoing that the Yamatake et al reference does not provide a method for detecting small periodic wave patterns and surfaces, as recited in Claim 14. Rather, the overall purpose and operation of Yamatake et al is to distinguish and eliminate such "non-defective irregularities" from consideration, so that defects, such as dents, etc. may be detected. As noted previously, and as discussed in the specification (translation at page 5, first paragraph, and in greater detail at page 8, last paragraph) the defects which are of interest are "localized irregularities, such as dents and debris". Accordingly, it is apparent that the Yamatake et al apparatus differs fundamentally from the present invention in its overall operation.

Even more significantly, Yamatake et al fails to teach or suggest all of the steps recited in Claim 14, for example. In particular, because Yamatake et al is not directed to the detection of periodic wave patterns, it contains no disclosure which discusses, teaches or suggests that a primary light beam be directed onto the surface which is to be inspected "approximately at right angles to expected

periodic wave patterns". This measure, together with the provision of a light beam which grazes the surface which is to be inspected make the method according to the invention uniquely advantageous in the detection of microscopic periodic wave patterns, which are disregarded and filtered out as noise in the Yamatake et al patent. Since, in Yamatake et al there is no concern with the detection of such periodic waves, it is apparent that there is no obvious directional preference with which the light should be shown onto the surface, for the detection of defects or "defective irregularities".

Finally, Applicants note that in this instance, the recitation in Claim 14 that the current method detects periodic wave patterns is not simply a statement of intended use, of the sort which, when contained in the preamble, is to be given no weight. In particular, the character of the present invention as defined in Claim 14 is reflected throughout the entirety of Claim 14, in which the body refers back to and incorporates the periodic wave patterns, throughout. Thus, the recitation that the primary light beam is directed onto the work surface "approximately at right angles to expected periodic wave patterns" refers back to the recitation of "small periodic wave patterns" in the preamble, and the latter is thus "necessary to give life, meaning and vitality" to the claim. *Pitney Bowes Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999). Moreover, the recitation of such a step of aligning the light beam perpendicular to expected periodic wave patterns has meaning and significance only in the context of a

claim which is directed to a method for detecting such periodic wave patterns in the first place. Accordingly, this language constitutes an element of the claim language which cannot be ignored or disregarded.

In addition to the foregoing, Claims 17 and 19 further distinguish over Yamatake et al based on features of the invention recited therein, which are not included in the reference. In particular, Claim 17 recites a step of subjecting the intensity distribution of the secondary light to an autocorrelation function and evaluating the results thereof. Yamatake et al fails to suggest any such processing step, and indeed, because Yamatake et al is unconcerned with detection of periodic changes, such an autocorrelation function would not be useful. In addition, Claim 19 recites a step of deducing the depth of wave troughs between crests from the period of the wave pattern. This step is also neither taught nor suggested in Yamatake et al. Accordingly, Claims 17 and 19 are allowable for these further reasons as well.

In light of the foregoing remarks, this application should be in condition for allowance, and early passage of this case to issue is respectfully requested. If there are any questions regarding this response or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket # 225/49845).

Respectfully submitted,

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